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Science fair projects have long been familiar events in schools throughout the country, and they have come to represent science in action, science as inquiry. The investigatory aspect of science fair projects fits wellwith current reform efforts guided by such publications as "Science for All Americans," "Benchmarks for Scientific Literacy," and the "National Science Education Standards." Classroom science is steadily being transformed into a process-driven, inquiry-based area of study, and science fair projects provide additional opportunities for students to become personally and directly involved in scientific investigation.

Elementary schools participate in science fairs for a variety of reasons: to stimulate student interest in science, to provide students with opportunities for research and active inquiry, to publicly recognize students' completed projects, and to provide students with opportunities to share their work (Perry,1995). There are many variations in format, but the primary components of a science fair project typically include an investigation, a written research report, a visual display, an oral presentation, and some sort of assessment. Learning some scientific facts or principles is a valuable fringe benefit for students doing projects, but the primary objective for science project work is to teach students to think (Tant, 1992, p.5.)

Students participating in science fairs are doing more than learning something new; they are using and extending knowledge gained previously through other experiences. Science fair work plans help students organize and review background information gained through previous library research on topics of interest. Past experiences will also help students make decisions on the importance of information to their topics.

The more a student knows about a topic, the easier it is to learn and remember new information (Recht & Leslie, 1988, as cited in Bruning, et al., 1995). Science fair projects provide students another avenue of learning more about topics of personal interest to them while also demonstrating both factual knowledge in written reports and procedural knowledge through the research process itself (Bruning, et al, 1995). Together, prior knowledge and newly acquired knowledge enable students to generate, analyze, and assess the impact of their findings, as well as connect what they learn to experiences beyond the science fair project.

DEVELOPMENTAL AND KNOWLEDGE LEVELS

The operational stages defined by Piaget's theory of cognitive development largely influence the types of science fair projects that elementary school students can be expected to conduct (Piaget,1969, as cited in Bruning, et al.,1995). Examples of appropriate projects include: (a) demonstrations of practical products such as cameras; (b) creation of models to show how natural phenomena, such as the water cycle, work; (c) illustrations of scientific concepts, such as magnetism, and how they relate to experienced phenomena; (d) collections that display and compare variations in objects, such as insect collections; and (e) investigations that show the effects of changes in treatment on systems, such as the effects of nutrients on plant growth (Perry, 1995.) Educational goals in elementary classrooms encompass students' social, personal, attitudinal, and cognitive development. In the social domain, science fair projects help students become responsible and purposeful. Science fair projects also foster development of a student's sense of personal capabilities and qualities. Additionally, science fair projects help students develop an appreciation for nature and the relevance of science in daily life, thereby promoting positive attitudes toward science. But the primary focus of science fair projects is on fostering the cognitive and intellectual development of students.

Participation in science fairs contributes to learning within the constructivist framework; students build on prior knowledge by gaining and using new information through their reading, observations, and experimentation. Collaborative interactions with peers, mentors, parents, and their teacher also enhance the experience. As Vygotsky has proposed (1979, as cited in Bruning, et al,1995) in his theory of the "zone of proximal development," the interaction between a novice and an expert can bring the novice to a higher level of accomplishment than the novice could expect to reach on his or her own. One role for teachers in science fair projects, then, is to engage students in the process of seeking and gaining knowledge, a reflective process that is enhanced through interactions teachers, peers, and materials.

A BROADER CONTEXT FOR LEARNING

Learning is influenced by a person's level of self-esteem and belief in his or her ability to learn. Bandura (1986, as cited in Bruning, et al, 1995) presents learning as being influenced by three components: the personal beliefs of learners, their behaviors, and the environment. Further, the behavior of each learner is influenced by his or her sense of self-efficacy, the level of confidence one has in his or her ability to achieve success. The sense of self-efficacy is usually domain specific; a student who excels in art, for instance, may have a lower sense of self- efficacy in science. Even within a specific domain of success, a student may not believe he or she can achieve success in a particular setting. For example, a student who earns an "A" on a science exam may not believe that he or she will do well in a science fair.
So, science fairs provide another context for learning science; students have an opportunity to go beyond the planned science curriculum to pursue individual interests and talents, and to examine practical problems with hands-on activities that link science with other facets of the curriculum. Science fairs provide students with opportunities to reflect and make sense of their total educational experience. (American Association for the Advancement of Science,1993).

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